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Title: **Sofa bed and its open-close mechanism**

Applicant: Gruppo Industriale Styling

5 **Technical field**

The present invention relates to a sofa bed and its open-close mechanism. As known, a sofa bed comprises an almost parallelepiped frame structure, which forms an internal containment area for bedding storage, and a number of movable frames, bound together. These frames move according to rototranslating motions from the close to open position. In the close position, the frames fold up to keep the mattress folded in a number of pieces and stored in the area created by the fixed structure; in the open position, the movable frames are consecutively aligned, outside of said volume and define a rest surface. These movements are made possible thanks to one or more mechanisms interposed between the fixed structure and the movable frames.

Up to now, various types of similar mechanisms with at least 20 three movable frames have been developed and many state-of-the-art mechanisms easily converts the sofa into a bed without having to remove any of the cushions. The present applicant has already described and claimed a similar product in the Italian patent application BA01A000005.

25 Despite the technical progress made, the known applications

show still several disadvantages. The largest limitation of the known mechanisms is the risk of accidental closing. In fact, when in bed position, should the user be seated close to the hinged joint between the frame (2) and the adjacent frame (3),
5 both in Fig. 1, an accidental closing of the bed may occur.

Disclosure of the invention

The invention solves the technical problem identified above, because it is a sofa bed comprising an almost parallelepiped
10 frame structure; a number of movable frames, bound together, that move according to roto-translating motions from the close to open position, wherein in the close position said frames are sequentially folded up, while in the open position, are consecutively aligned; and a mechanism that moves said frames,
15 characterized in that the mechanism comprises at least one lever, hinged to the joint between the frame (2), said headrest, and the adjacent frame (3), preventing the lowering of the above mentioned joint. In this way, the problem of accidental closing of the bed has been solved.
20 According to a subsequent aim, the invention is capable of moving the seat cushion by means of only two additional elements.
Furthermore said mechanism has one degree of freedom only and opens and closes in one movement without removing seat and
25 back cushions (21) and (19).

These and other advantages will be pointed out in the detailed description of the invention that will refer to the figures of tables 1/2 and 2/2 in which an exemplifying and not restrictive embodiment of the invention has been carried out.

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Way of carrying out the invention

With reference to the above mentioned tables:

- Fig. 1 shows the sofa-bed structure in the “bed” position;
- Fig. 2 shows an axonometric view of the same sofa bed;
- 10 • Figs 3, 4 and 5 show three consecutive steps of the sofa bed open operation;
- Finally, Fig. 6 shows a detail of the frame in the “bed” position.

With reference to the previous figures, the mafore-entioned goals
15 were met thanks to a sofa bed comprising a driving mechanism, positioned between each/a frame and the following one. Said mechanism has synchronization tools to move the movable frames from the close to open position, and viceversa, in one movement only.

- 20 The sofa bed (Fig. 2) is identified with the number/reference (11), while the fixed structure with (7). The frame structure has an almost parallelepiped shaped, which forms an internal containment area and is composed of several frames. Among such frames, at least one acts as a support for the back cushions.
25 The fixed structure (7) defines an internal containment area (14),

inside which the movable frames, bound one with the other, fold up to convert the sofa bed in the sitting position. Then, said movable frames can switch from close to open position (see the sequence in Figs. 3, 4 and 5), provided that they are aligned,
5 forming a rest surface, numbered with (15).

The present mechanism, numbered with (10), comprises synchronization tools, interposed between the movable frames, to move the frames from the close to open position (see again the sequence in Figs. 3, 4 and 5), and viceversa, in one movement. It
10 comprises a quadrilateral (16), a quadrilateral (12) and a quadrilateral (17). The lifting and opening system of said mechanism is provided by the quadrilaterals (16) and (12), and by springs (not shown in the figures) to facilitate the operation. In particular, a first retain elastic mean is interposed between the lever (6) and the lever (1), while between the lever (1) and the fixed structure (7) is interposed a second retain elastic mean.
15 Said elastic means can also be positioned on those elements fastened to elements (6), (2) and (7). The quadrilateral (12) provides the headrest (2) in the bed configuration, while, in the
20 sitting configuration, said headrest is vertical. The quadrilateral (16) moves synchronically the rest of the mechanism by means of levers (8) and (9) hinged to the fixed structure (7). As an alternative to it, the lifting of said mechanism can also be obtained by means of two simple quadrilaterals (not shown in the
25 figures), one end of each one is hinged to the fixed structure (7),

and the other end is hinged to the frame (2). The two quadrilaterals are joined together by means of a lever, which makes synchronous their motion. Said quadrilaterals determine the vertical translation of the frame (2), from bottom up during
5 the opening, from top down during the closing.

Finally, the quadrilateral (17), shown in Fig. 6, comprising the levers (4), (5), part of lever (25) and part of lever (23), moves the sliding system of the seat cushions (21).

Beside the conversion from sofa to bed, and viceversa, the
10 mechanism has been also designed to perform a particular trajectory. Following this trajectory the mechanism reaches a height above the ground that makes itself manageable, as one can see in Fig. 4. The strong point of this new mechanism is (Fig. 1) the fact that the lever (1) is hinged in the joint (2')
15 between the headrest frame (2) and the central frame (3). From a functional point of view, it solves the problem of accidental closing of the bed. In fact, in known mechanisms, the lever (1) is hinged on the headrest frame (2); consequently, accidental closing may occur when the user is seated close to the hinged joint
20 (2') between the headrest frame (2) and the adjacent frame (3). Another strong point of this mechanism is the movement of the seat cushions (21) by means of only two additional elements. The addition of elements (4) and (5) creates an easy system based on an articulated quadrilateral (17). An additional feature
25 of the mechanism is that the lever (6) can have five holes (as in

the embodiment of Fig. 1), or four holes can be bolted directly to the fixed structure (7). In the case of a 5-hole lever, the lever (6) being hinged to the levers (8) and (9) performs a roto-translation. In the four holes configuration, the lever (6), instead of roto-translating, can rotate around a point fixed with respect to the fixed structure (7). This means the elimination of the levers (8) and (9).